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ABSTRACT

This guide sets forth minimum approval criteria for metals occupational clusters training programs in Oregon. The information in the guide is intended for use by district-level curriculum planners, teachers, regional coordinators, or state education department staff involved with new program development or revisions of existing programs. The guide outlines the instructional content of metals trades programs (such as welder, machinist, auto body repairer) in terms of program descriptions, areas for training, program goals, course/content goals, and sample performance objectives. Course goals are listed under such headings as safety, communication, mathematics, science, cutting, finishing, human relations, and career guidance. Course titles and descriptions are also included. A section on organizational options is designed to illustrate a few of the many ways to deliver the minimum instructional content required for an approved vocational cluster program. Content is illustrated by course titles for the instructional levels to recognize that students from different grades may enroll in one or more levels of a program. (KC)

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CLUSTER BRIEF

METALS

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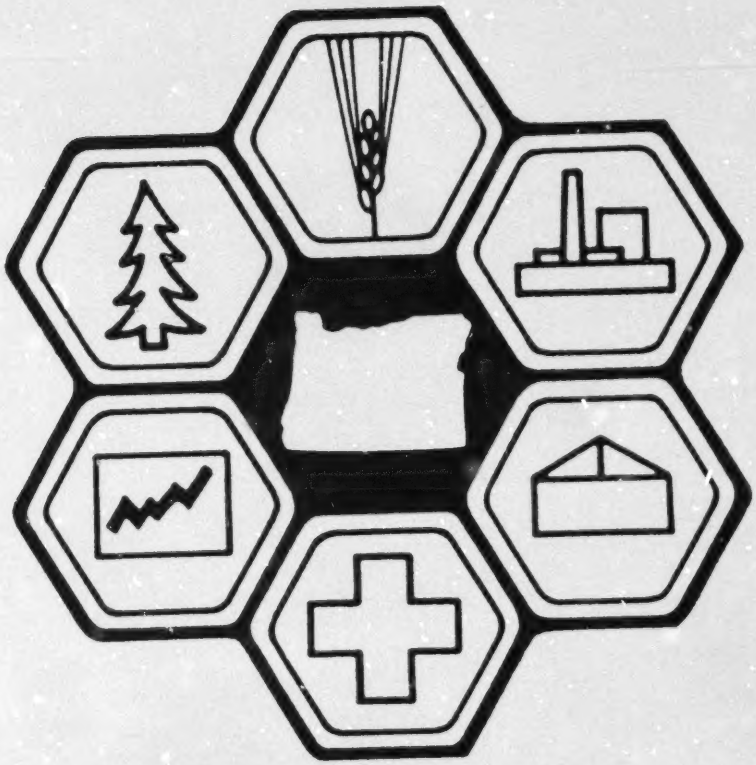

Vocational Education in Oregon

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METALS VOCATIONAL CLUSTER PROGRAM
MINIMUM APPROVAL CRITERIA

The following information is for use by district-level curriculum planners, teachers, regional coordinators or Department staff involved with new program development or revisions of existing programs. For more information about instructional content, see the Curriculum Guide for the Metals Cluster.

The minimum approval criteria for a Metals Cluster program are set forth in this document. The instructional content is outlined in terms of program descriptions, areas for training, program goals, course/content goals and sample performance objectives. Course titles and descriptions are also included.

The section on organizational options is designed to illustrate a few of the many ways to deliver the minimum instructional content required for an approved vocational cluster program. Please note that time is illustrated in terms of credits. Content is illustrated by course titles for the instructional level(s) to recognize that students from different grades may enroll in one or more levels of a program.

Program Description

The metals cluster groups occupations by tasks pertaining to the conversion of raw material into a base metal and the consumption of metal in the manufacturing process.

Areas for Training

The key occupations in the metals cluster are:

Welder
Machinist
Foundry worker
Auto body repairer (metal only)
Sheet metal worker

Program Goals

Students will be able to:

- Work safely and apply proper first aid procedures to metal working industry standards.
- Communicate through the written, spoken and symbolic language of the metal working industry.
- Perform mathematical calculations commonly used in the metal working industry.
- Apply basic scientific data and principles commonly used in the metal working industry.
- Select and use measuring tools commonly used in the metal working industry.
- Select appropriate machines/methods and safely perform various cutting operations.
- Select appropriate machines/methods and safely perform various shaping operations.
- Select appropriate machines/methods and safely perform metal joining operations.
- Select appropriate equipment/methods and safely perform metal finishing operations.
- Apply appropriate human relations skills in a work setting.
- Identify a variety of career operations and career ladders including entrepreneurship available in the metal working industry.

Course/Content Goals

SAFETY

The student will be able to:

Select appropriate protective clothing and equipment for each task.

Lift and carry materials and equipment in a proper manner.

Use power tools safely.

Use pneumatic tools safely.

Select appropriate eye protective equipment.

Select appropriate ear protective equipment.

Apply appropriate safety precautions relating to dust, fumes and gasses.

Use proper methods for handling and storage of materials.

Use hand tools safely.

Maintain good housekeeping in the work area.

Apply proper first aid and CPR techniques.

COMMUNICATION

The student will be able to:

Read and interpret blueprints, drawings and specifications.

Use manuals, reference books, and catalogs.

Use terminology of the metalworking trades.

Use sketching for communication.

Use oral communication with meaning and clarity.

Prepare work orders, work schedules and other written communications of the metalworking trades.

MATHEMATICS

The student will be able to:

Add, subtract, multiply and divide whole numbers to solve practical problems of the metalworking industry.

Calculate by decimals, fractions, percentages and ratio and proportion.

Calculate areas of rectangles, circles and volumes of three dimensional objects.

Use algebraic and geometric principles required in the metalworking industry.

SCIENCE

The student will be able to:

Apply basic mechanical principles involving belts and pulleys, gears and levers.

Identify common metals and alloys through visual, chemical and mechanical analysis.

Use common test equipment. (destructive and nondestructive)

Select the appropriate heat treating procedures to suit the metal and the use.

Identify characteristics of chemicals used in the metalworking industry in cutting, testing, finishing, heat treating and casting procedures.

MEASUREMENT

The student will be able to:

Use steel rules and tapes.

Use layout tools and interpret blueprints.

Use gauges.

Use precision measurement tools.

CUTTING

The student will be able to:

Cut metal with hand tools.

Cut metal with sheet metal machines.

Cut metal with electric hand tools.

Cut metal with power saws and shears.

Cut metal with drill press.

Cut metal with oxy-acetylene torch.

SHAPING

The student will be able to:

Shape metal with sheet metal machines.

Shape metal with bending machines.

Shape metal on a lathe.

Shape metal with milling machine.

Shape metal with shaper.

Shape metal with casting processes.

Shape metal with grinders.

JOINING

The student will be able to:

Join metals with hand tools and fasteners.

Join sheet metal seams.

Join metal by gas welding and brazing.

Join metal by electric welding and brazing.

FINISHING

The student will be able to:

Finish metals with hand tool processes.

Finish metals with machine tool processes.

Finish metal with abrasives and polishes.

Finish metal with prints and lacquers.

HUMAN RELATIONS

The student will be able to:

Work cooperatively with fellow employees, employers and customers.

Demonstrate positive attitude toward job.

Accept leadership responsibilities at work site.

CAREER GUIDANCE

The student will be able to:

Identify jobs and working conditions for each of the key occupations in the metals cluster.

Define requirements and routings for entry into each of the key occupations.

Describe the career ladders for advancement within each of the key occupations.

Use appropriate job search techniques.

Describe entrepreneurship opportunities in the metalworking industry.

Sample Performance Objectives

Given safety tests on the uses of equipment and practices in the metal shops, the student will answer all questions with 100 percent accuracy.

Given a vernier height gauge, a surface plate, metal and a print, the student will locate lines and points to an accuracy of ± .010" or ± .080mm.

Given an electric hand shear, sheet metal and a working drawing, the student will cut the metal within ± 1/8" of the required size.

Given sheet metal equipment, prints and sheet metal and using common industry procedures, the student will fabricate a groove seam, riveted lap seam, a Pittsburg lock seam, a dovetail seam and a spot welded lap seam to the required specifications.

Given spray painting equipment, paint materials and a metal project, students will be able to use common industry procedures to produce a finish suitable to industry standards.

Course Titles and Descriptions

METALS CLUSTER I: This is the first level of instruction in the vocational metals cluster program. Instruction is offered on a basic level in all five of the key occupations: welding, foundry, machining, sheet metal, and auto body repair. Students learn the basic materials, basic tools and equipment use. They also learn the basic technology of the metal working industry. The communication skills, math, and science skills associated with the metals occupations are incorporated into the instructional program.

METALS CLUSTER II: This course provides students opportunities to build on the information base and skills that they developed in Metals I. More complex technologies are utilized in the instruction program. Time is provided for more skill development in the use of equipment and the acquisition of knowledge relating to the metals industry. Students are introduced to the more advanced technology relating to metal working such as basic CNC and robotic theory. They are also provided an opportunity to participate in work

experience activities as they are available. The communication skills, math, and science skills associated with the metals occupations are incorporated into the instructional program.

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Minimum Metals Vocational Cluster Approval Criteria

In addition to specific cluster criteria, state-approved vocational programs shall meet the criteria for approval of all secondary vocational education instruction as listed in the Handbook of Policies and Procedures for Vocational Education Instruction in Oregon Secondary Schools, 1985.

Criteria outline:

- 4 credits (130 hours per credit) offered
  - 2 credits each of two years or 4 credits in one year.
- Instructional time blocks of sufficient duration for skill development to meet industry standards.
- Program goals, course goals and instructional content which reflect those in the state cluster brief.
- Provision for occupational cooperative work experience. If offered, it must be in addition to the 4 credit basic instructional program.
- Vocationally certified teacher.
- An active, representative occupational advisory committee.
- Vocational Industrial Clubs of America (VICA) as an integral part of the instructional program.

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Organizational Options

There are many acceptable options for delivery of instructional content while assuring that a quality program is provided. Schools have the opportunity to schedule classroom and laboratory activities to accommodate students and to facilitate learning. Delivery options include after school, weekends, summer school or alternate days.

Option	1 Year Program	2 Year Program	3 Year Program
Level I			Basic Metals 1 Credit
Level II		Metals I 2 Credits	Metals I 2 Credits
Level III	Metals I & II 4 Credits	Metals II 2 Credits	Metals II 2 Credits

Option D

1 to 3 year program

flexible time
flexible credit

For Option D, 75 percent of enrolled students must pass appropriate student occupational competency achievement test at completion of program with a score equal to or better than national norm. Tests are developed by the National Occupational Competency Testing Institute (NOCTI). Contact NOCTI liaison person, Oregon Department of Education, 378-3376.

If you need technical assistance, call the Occupational Program Specialist at the Department of Education. The specialist's name and phone number appear on the first page of this document.

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